**Ansatz:** Combination of laser ablation and quantitative spectroscopy.

**Laser Induced Ablation Spectroscopy (LIAS)**

- Laser pulse with high power density \( (k=1064 \text{ nm}, \ E_{\text{Laser}} = 1.5 \text{ J, } \tau_{\text{pulse}} = 7 \text{ ns}) \) irradiates pre-deposited sample inserted through limiter lock.
- Laser beam leads to rapid heating and sublimation/evaporation of sample material.
- Ablated particles enter the tokamak edge plasma.
- Light emitted due to interaction with fusion plasma is observed.

**Investigation Method:** Laser energy scan for mixed (W/C/Al) layer in ohmic discharge.

**Linear dependence for D_2 photons (injected atoms) found.**

**Reason for discrepancy between S/XB values under investigation.**

**W/C/Al mixed layer:** Laser energy variation

- \( 0.8 \text{ J/cm}^2 \), \( 1.5 \text{ J/cm}^2 \), \( 3.2 \text{ J/cm}^2 \)

**Photon efficiency of Deuterium in a-C:D layers**

- Linear dependence for \( D_2 \) photons (injected atoms) found.
- Reason for discrepancy between S/XB values under investigation.

**Radial profile comparison**

- Radial emission profiles remain unchanged.
- Radial emission profiles extend further with increased laser power.
- No indication of plasma perturbation.

**Toroidal profile comparison**

- Toroidal FWHM decreases with laser energy.
- Consistent with plasma perturbation.
- No indication of plasma perturbation.

**Summary and Conclusions**

LIAS was performed on different pre-deposited samples to show the feasibility as a diagnostic for the first wall in fusion devices.

- The ability to utilize LIAS for hydrogen inventory measurements is shown. Layers thinner than 100 nm can be resolved in TEXTOR.
- Quantitative spectroscopy allows inventory measurements for a-C:D layers with S/XB=67.8±20.4.
- Indication of plasma perturbation for mixed layers \( \Rightarrow \) variation of laser parameters.

**Outlook**

Modeling work of radial profiles started to explain observed S/XB value with ERO (www.ero-code.de) and Hydkin (www.hydkin.de) at Forschungszentrum Jülich.